ENTERPRISE SYSTEMS UPGRADE DRIVERS: A TECHNOLOGICAL, ORGANISATIONAL, AND ENVIRONMENTAL PERSPECTIVE

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Abstract

The decision to upgrade Enterprise Systems (ES) is influenced by various factors, which are either internal or external to the organisation. Although previous studies have explored these factors, the majority of these studies have focused on Enterprise Resources Planning (ERP) systems only. Thus, this study through a qualitative survey design draws from the expertise of 41 respondents representing 23 large organisations the different factors that influence upgrade decisions of the entire ES landscape. The paper utilises the Technology-Organisation-Environment (T-O-E) framework as a theoretical lens to classify the upgrade drivers into three main contexts: technological, organisational, and environmental. The paper's findings suggest that upgrade decisions are dependent on establishing the need to upgrade, which relies on the interaction of the numerous technological, organisational and environmental drivers. This classification facilitates organisations to easily comprehend the different drivers influencing the decision to upgrade their systems.

Keywords: Enterprise Systems, ES upgrade, Upgrade Drivers, Qualitative Survey.

1 INTRODUCTION

The shift in operating conditions and ever-changing business environments has led many organisations to adopt Enterprise Systems (ES) as a mechanism to gain competitive advantage and improve performance. Over the years, these systems have matured and offer functionality that not only improve performance and minimise maintenance costs, but also offer the capability to re-examine and automate business processes (Beatty & Williams 2006; Leyh & Muschick 2013). According Olson & Zhao (2007) upgrading is a continuous activity that recurs throughout the system's lifespan and is considered as an important aspect in the system's lifespan. Yet, few organisations opt to upgrade their systems, this hesitation implies that organisations utilise outdated systems and risk losing continued technical support or obtaining support at a very steep price, along with encountering bottlenecks in systems' performance and functionality. Though, it is possible for organisations to gain benefits from upgrading, yet the initial investment and risks associated with the process makes the decision not trivial; then again not upgrading can result in increased operational overheads, suggesting that upgrade decision-making is complex. Additionally, upgrading requires an extensive understanding and knowledge of the underlying system and business processes, as changes applied in one business module may affect other modules of the associated system (Rothenberger & Srite 2009). Thus, according to Beatty & Williams (2006) the upgrade project team encompasses personnel with diverse roles that offer varied expertise needed to support upgrade projects. However, these stakeholders are driven by different agendas, which results in them having diverse perspectives on what drives organisations to upgrade their systems.

While, to date research on ES upgrade recommends practical guidance for managing and supporting upgrade projects, with several studies identifying numerous factors that influence upgrade decisions (discussed in section 2.1). Although these studies offered valuable insights into upgrade drivers, most of these studies focused on ERP systems, with the exception of Khoo & Robey (2007) whose study focused on ERP and Microsoft Windows 2000 operating system. Despite the majority of these studies focusing on ERP systems, it is not clear, whether similar drivers would influence upgrade decisions in context of the whole ES landscape. In addition, Paradonsaree et al. (2014) and Scheckenbach et al. (2014) state that research on upgrades is scarce, thus, concurring to Grabski et al. (2011) call for further research to explore the post-implementation phase. Hence, this paper investigates ES upgrade decision-making and aims to address the following question: what drivers influence organisations to upgrade their systems, irrespective of the type of ES?

This paper is organised as follows, the second section provides an overview of ES upgrade and positions ES upgrade as a technology assimilation process. The third section outlines the methodology adopted in this research. The fourth section highlights the key findings and discusses the classification of upgrade drivers and draw relevant conclusion by relating these findings to the existing body of knowledge.

2 ES UPGRADE OVERVIEW

There are many instances in literature where Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) systems have been referred to as ES used for example (Beheshti & Beheshti 2010), implying these systems and ES are indistinguishable. As such, ERP systems can be classified as a dedicated system that enables business processes integration on a specific technological platform to address organisation specific processing needs (Nah & Delgado 2006; Elragal & Haddara 2012). In contrast, Davenport et al. (2004) suggests that ES constitutes a variety of comprehensive systems in combination with other technologies to support supply chain optimisation, sales force automation, and customer service. Ward et al. (2005) substantiate this explanation and describe ES as a comprehensive, configurable, and integrated suite of systems and information resources, which support organisational-wide operational and management processes. Furthermore, Xu (2011) posits that ES encompasses capabilities to integrate and extend business processes within and outside of the organisation. Therefore, it can be argued that ES incorporates ERP and other systems such as Customer Relationship Management (CRM), Supply Chain Management (SCM), and so forth, providing a complete overhaul of the transactions processing systems landscape (Markus & Tanis 2000; Shang & Seddon 2002). Thus, in this paper, ES is referred to as a holistic system that incorporates numerous systems that offer a range of capabilities to support organisation-wide end-to-end processes, which enable integration, collaboration, interaction, and the processing needs within and outside of the organisation.

The implementation of ES is a complex phenomenon due to its intangible nature and according to the market survey results by Panorama (2014) cited by Ng & Wang (2014) very few organisations tend to realise the full potential of ES. According to Willis & Willis-Brown (2002) the actual ES value becomes visible and realised after the system 'go-live', a period referred to as post-implementation phase. Several stages have been proposed as part of the post-implementation phase to support organisations' to manage their systems effectively and efficiently, in order to take advantage of the benefits offered by these systems. For example, the ES life cycle definition from Motiwalla & Thompson (2009) offer four stages that is stabilisation, backlog, new module and major upgrade as part of the post-implementation phase. The backlog stage deals with modification development, evaluating new requirements and processes to support business needs. The new module stage extends the implemented system with additional capabilities to support existing processes and improvement of performance. The major upgrade stage focuses on extending and expanding the existing systems depending on business needs and keeping pace with the vendor's version release cycle. Based on this classification by Motiwalla & Thompson (2009) this paper focuses on major upgrades and interchangeably refers to it as upgrade.

Upgrading is considered as one of the main activities that ensures continuous improvement and stability of the system's (Hecht et al. 2011). Therefore, upgrading can be defined as a process that intends to expand the existing system's core capabilities by improving functionality and taking advantage of new technology features, offered in a new version (Vaucouleur 2009). While Ng (2011) defines upgrading as replacing the existing version entirely or partly with a newer version from the same vendor or different vendor. Both these definitions suggest that upgrade results in functionality improvement when compared to the current installed version. However, it also signifies two upgrade dimensions: same system version-to-version upgrade and system-to-system upgrade. Version-to-version upgrade implies that the current installed system is replaced with a newer version of the same system from the same vendor in order take advantage of the new functionality and technology capabilities. While system-to-system upgrade means that the currently installed version is traded with another system altogether possibly from a different vendor, this could be because the new version does not support the organisation requirements. Therefore, this paper adopts the first dimension, and investigates version-to-version upgrade decisions. Drawing from Seibel et al. (2006) explanation, it can be argued that vendors frequently release new versions, therefore there is a huge possibility that organisations opt to upgrade their current system version instead of implementing a new system, as they are familiar with the system capabilities. However Ng & Wang (2014) reason that upgrading is a complex and risky project with a tendency of disruption to operations and running over-budget.

On that basis and according to Claybaugh (2010) the timing of upgrade is an important aspect to consider especially when establishing a balance between frequently upgrading against high costs and risk associated with upgrades. Therefore, the fundamental questions most decision makers ask during upgrade a decision is when to upgrade and this is normally influenced by the different upgrade drivers. According to Dempsey et al. (2013) the decision also involves selecting which upgrade type would best suit the organisational requirements, as organisations can either undertake a technical or functional upgrade or a combination of both. Technical upgrade entails moving the existing system to the latest technology platform version and focuses purely on technology aspects of the system. Whereas, functional upgrade mainly focuses on functionality extension and optimising business processes based on the organisation's business needs and tactical direction. This may also involve consolidation of different systems, to provide better agility and flexibility to support systems integration and implementation of new business processes or automating existing manual processes.

2.1 The Need to Upgrade

There are several reasons that influence organisations to upgrade their systems; this section outlines previous studies that have focused on exploring these various drivers (explained in sections 2.1.1 to 2.1.3). Based on the findings from two case studies Khoo & Robey (2007) categorise the upgrade drivers as two forces that either motivate or inhibit upgrade decisions. The motivating forces are factors that positively influence the organisation to upgrade their ES; these are new functionality, vendor support, and collaboration. The inhibiting factors cause the organisation not to consider upgrading their systems; this includes costs and risks associated with upgrades. In another study, Otieno (2010) collects and analyses data from three case organisations to address why organisations opt to upgrade their systems, however, Otieno classifies these factors in a similar manner to Khoo & Robey (2007). While in their study Dempsey et al. (2013) explore the factors that influence organisations to upgrade, through a single case organisation and group these reasons as motivating and inhibiting factors. Whereas, Claybaugh (2010) focuses on understanding how the different upgrade drivers influence the decision to upgrade and identifies drivers from existing IS literature and classifies them into three contexts, that is technological, organisational, and environmental and establishes the level of influence after surveying 190 experts. Kankaanpää & Pekkola (2010) investigates the timing of ES upgrade and establish the factors that trigger the upgrade decisions based on the findings obtained interviewing 15 CIO's in order to explore and recognize the conditions that affect the upgrade timing. Most of the studies are centred on ERP systems with the exception of (Khoo & Robey 2007) and (Vaidyanathan & Sabbaghi 2007).

Therefore to date there are fragmented views on how these drivers influence the entire ES landscape. Understandably, each system within the ES landscape is implemented for a specific purpose and there is a huge possibility that the drivers that influence upgrade decisions can be different from one system to another. Although different approaches are used to categorise these drivers, similarity and common themes between these drivers can be identified. However, it is not clear whether similar drivers would influence ES upgrade regardless of the type of systems within the ES landscape. Hence, this study attempts to understand and identify what motivates organisations to upgrade their ES.

2.1.1 External Factors

These external factors define conditions that give the organisation little choice but to upgrade their systems. Mostly these factors would be initiated by different external stakeholders, such as vendors, partners, consultants, and legal entities. For example, the frequent versions release cycles introduced by vendors creates a dilemma of when it is appropriate to upgrade. Since on one hand, vendors provide organisations with the flexibility of not upgrading frequently, as they support multiple versions (Khoo & Robey 2007). On the other hand, vendors use high license fees and support pricing schemes for older versions as a technique to encourage organisations to upgrade their systems (Sawyer 2000). Thus, it is important to contemplate the benefit of frequently upgrading against upgrading only when it is necessary for the organisation. However, when vendors ultimately remove support for the older versions, organisations are forced to upgrade (Otieno 2010). This is mostly applicable to organisations that are depending on vendors for support, and have to upgrade to keep within the vendor release cycles in order to ensure continuous support. Another external factor is compliance, as government agencies have a significant influence on driving upgrades in order to fulfil government regulations such as taxation. Another perspective of compliance involves organisations in highly regulated environments such as education institutes and banking who have to follow directive and regulations set by centrally governed agencies or governmental bodies (Khoo & Robey 2007; Ng & Wang 2014). The challenge arises when these regulations change or are updated, which enforces the organisation comply, and as a result would need to upgrade their systems within a certain timeframe.

In context of environmental factors, the literature portrays a mixed reaction on the significance of these factors in influencing upgrade decisions. For example, Otieno (2010) suggests that business needs which include the requirement for new functionality and automating processes have more priority when compared to environmental factors. Whereas Claybaugh (2010) has demonstrated that there is a mutual degree of influence from organisational and environmental factors on upgrade decisions. Thus, it is important to establish whether environmental factors have any influence on upgrade decisions and determine the extent of that influence on organisations' decisions to upgrade their systems.

2.1.2 Internal Factors – Organisational

These generally originate from the need to achieve the strategic direction of the organisation, such as access to important information, which support making decisions and improve productivity (Beheshti & Beheshti 2010). Important information in this context represents accurate, timely, and relevant information that facilitates making decisions with ease. Another aspect is to leverage ES in order to gain competitive advantage by improving productivity and increasing financial performance through aligning business strategies with functionality (Nicolaou & Bhattacharya 2006). Alignment of the system can be achieved through expanding the existing systems capabilities through either modifying the system or implementing new features. According to Otieno (2010) the aligning of the system's functionality to organisation strategies could be accomplished by upgrading to a newer version. Thus, considering and planning for alignment may result in the organisation upgrading their system to take advantage of the new version features, in order to achieve existing and future goals. Normally, these organisational needs result in business transformations, which ensure that the organisation adapts to the changing economic and market conditions. Worrell (2008) suggest that in order to support the transformations, the organisation requires eliminating redundant processes and re-engineering some of the processes or the implementation of new business processes. Some of these processes are available in the new versions, hence supporting the need to upgrade in order to be competitive. Organisations consider upgrading as means to take advantage of new technologies and capabilities to support their systems and business processes, in turn improve their competitiveness.

2.1.3 Internal Factors – Technological

Technological reasons are concerned with how technology advancements benefits the organisation; however, what one organisation perceive as a benefit is not always reciprocated in another organisation (Claybaugh 2010). Markus & Tanis (2000) suggest that it is possible for two organisations to achieve the same benefit but gain different value from the benefit. Therefore, the benefits and added value for upgrading is achieved by comparing the new version against the existing version to gauge the usefulness and contribution of both versions (Ng 2011). The new version value materialises from its contribution of new functionality, improved business process and technologies (Dempsey et al. 2013), thus it can be argued that organisations are more likely to upgrade when the benefits are known. Additionally, Davenport et al. (2004) suggest that integration of different ES instances is an on-going process due to mergers and acquisitions, this frequent changes in business structures and process, dictates the need to implement technologies that support integration with other systems (Olson & Zhao 2007). Generally, these new technologies are made available with latest versions, however due to improvements in the new version there may be a necessity to upgrade the infrastructure that supports these systems, to avoid performance bottlenecks and incompatibility issues (Farbey et al. 1993). According Whang et al. (2003, p.1035) it is common for changes to the operating system and database system to occur 'due to the higher version requirements', citing a case of an organisation that increased their memory capacity for the database and application servers to support the new version. This implies that it is important to consider hardware changes and their impact when upgrading. Another issue to consider when upgrading is the compatibility of these changes on the existing version's functionality or prior modifications implemented to the system. The complexity increases, particularly when there are inter-organisation systems, for example in order to remain competitive, an organisation integrates their ES with their supplier systems (Ng 2001; Vaidyanathan & Sabbaghi 2007). Hence, when the supplier upgrades their system, it may be necessary to upgrade the connected systems, in order to remove any reliability issues that can hinder smooth operations. Hence, understanding what drivers influence the need to upgrade could facilitate identifying the changes required and the challenges that may arise by introducing these changes.

2.2 ES Upgrades as Assimilation

Drawing from Information Systems (IS) innovation taxonomy by Swanson (1994), which suggests that an assimilation process, results from three scenarios: first to enhance efficiency of the IS tasks, second to improve administrative functions and lastly to enrich the features embedded in the core systems. In comparison to ES upgrades, Khoo & Robey (2007) propose that ES upgrade introduces changes to the existing business processes and implementation of new functionalities. In addition, upgrading expands core system capabilities by taking advantage of new technology features (Vaucouleur 2009). Lastly upgrading ensures that the system is stable, operates efficiently, and can be expanded according to the organisation's needs (Motiwalla & Thompson 2009; Hecht et al. 2011). As such, upgrading results in productivity and systems performance improvement, minimisation of maintenance efforts, and competitiveness, hence, it can be argued that ES upgrades can be considered as an assimilation process. There is extensive use of the T-O-E framework, with various studies focusing on ES adoption for example (Raymond & Uwizeyemungu 2007; Pan & Jang 2008; Safavi et al. 2014), and very few focusing on ES upgrade such as Claybaugh (2010). Thus it can be argued that considering upgrade as assimilation of technology allows comprehending the factors affecting the decisions as organisations are at different stages of the assimilation processes (Claybaugh 2010).

In addition, the literature demonstrates that T-O-E framework has an established theoretical base and consistent empirical support for studying ES upgrades as adoption of innovation. The T-O-E framework suggests that the decision to adopt an innovation is influenced by external and internal factors, including the characteristics of the technology. As a result, these influences are classified in three contexts: technology, organisational and environmental. The technology context represents existing new technologies relevant to the organisation. Organisational context describes the internal measures such as scope, size, managerial structure, and availability of resources. Environmental context refers to the field in which the organisation operates, this includes elements such as government legislation and vendors' support (Tornatzky & Fleischer 1990). Against this backdrop, we adopt T-O-E framework, as an investigative lens for analysing and studying the drivers that influence ES upgrade decisions.

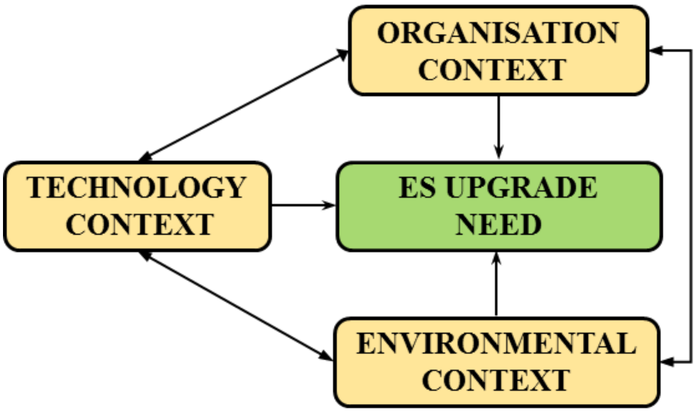

Figure 1. ES upgrade - T-O-E view.

3 METHODOLOGY

This research follows a qualitative survey design, according to Fink (2003) and Jansen (2010) from a methodological perspective qualitative survey allows to cross-examine multiple respondents and gather upgrade experiences from multiple organisations, to establish common and diverse views on the factors influencing upgrade decisions. Thus, offering insights into complex issues based on gathering realistic information from respondents knowledge and experience, to describe and explain on the factors influencing ES upgrade decision-making. The study included two data collection techniques that is self-administered web-based questionnaires and semi-structured interviews.

The questionnaires main purpose was to establish experts' attitudes and experiences along with identifying the upgrade processes practiced in their organisations. In order to capture the experts understanding of the ES upgrade process, the instrument included both open-ended and close-ended questions; the closed-ended questions asked the respondents to indicate their level of agreement or disagreement based on a five point Likert scale and yes or no answer option. Mostly these kind of questions were utilised to capture if the factors identified in literature were applicable to ES upgrade landscape. The open-ended questions supplemented the closed-ended questions, allowing probing for more details by encouraging the participants to provide descriptive accounts of their experiences on ES upgrade. The output from this stage helped to identify the activities that were undertaken and enable gaining a high-level view of the upgrade processes. Although the use of web-based questionnaires had its benefits there have been some criticisms; thus to improve the data quality the study employs another data collection technique (semi-structured interviews) as a mechanism to improve the quality of the data. The semi-structured interviews were conducted to supplement and obtain an in-depth understanding on some of the diversified patterns identified in the previous data collection stage. Semi-structured interviews were used because they offer a flexible approach to explore complex issues, and gain rich detailed insights based on people experiences and knowledge on the ES upgrade processes.

3.1 Participant Selection

Two non-probabilistic sampling techniques that is snowballing and purposeful sampling were utilised in this research. The targeted respondents represented diverse roles, such as functional (business) users, technical leads and database managers, systems administrators, chief information officers, project managers, end-users and consultants. Targeting, this diverse roles was triggered by the explanation by Beatty & Williams (2006), which suggests for effective upgrade projects, the team involved during upgrade should include representative from functional, technical and management. In order to recruit the specified respondents, first SAP and Oracle UK user groups administrators were contacted to request contact details of their members; as both these user groups represented organisations from UK and Ireland, which either use systems from SAP or Oracle, JD Edwards, PeopleSoft, and Primavera. The administrators from both user groups offered to circulate our request in their monthly newsletters to all their members. Secondly, a snowballing technique was used to search for experts who may not be part of these groups, as they could offer a different experience of upgrading other systems. The approach involved searching LinkedIn database for experts based on the description provided in their profiles, to ensure the subject experts meet the criteria once the experts were identified, an email was sent out inviting them to participate in the study; in addition, we politely requested them to forward the message to their contacts with similar experience.

3.2 Data Analysis

Inductive content analysis principles guided the overall data analysis strategy, since the goal was to compare data and categorise the trends represented within the data, in order to address the research question. As part inductive content analysis approach, the following three steps were followed: preparing the data, systematic coding, and drawing conclusions. Preparing the data involved studying the data as a whole to get a broader picture on how it reflected the research question. This involved summarising the concepts to collaborate and understand the commonality between the data. Systematic coding allowed tagging, separating and grouping the data into meaningful categorises. Thus, reducing the data into high-level analytical content based on the similarity of the meaning assigned, with the intention of inductively deriving the categories from the data to gather theoretical attributes. Drawing conclusions involved drawing inferences from the data through exploring the identified categories and their properties in order to explain grouping and provide a new understanding based on the theoretical propositions identified.

One main concern of the qualitative approach is ensuring the quality of data and rigor. As this study is dependent on the respondents' experience of ES upgrade processes and generally collects data from a one respondent per organisation, therefore crosschecking the information provided against a counterpart in the same organisation was difficult. In order to increase confidence of the findings, this study incorporates within method triangulation and respondent validation as strategies. The within method triangulation was achieved by using two data collection techniques; these are survey questionnaires and semi-structured interviews. Thus, the semi-structured interview was used to offer further clarification to some of the trends identified during the web-based questionnaire analysis. This enabled crosschecking of the data between these two data collection techniques, which allowed to complement the deficiencies and biases that may arise when using a single method (Creswell 2009). In addition, respondent validation was applied in twofold: first, the summary of interviews was sent to the interviewees to validate its contents for accuracy and if necessary amendments were made to the interview summaries. Once the review was verified, some of the details were posed as additional questions to the other interviewees, to get their opinions on the earlier descriptions of upgrade decision-making. Then a comparison between the answers was done to analyse the similarity of the different experiences. Second, the findings were evaluated by presenting to a different group of respondents with similar upgrade experience and knowledge, to assess the accuracy of the findings and its applicability and significance in influencing ES upgrades decision.

4 FINDINGS AND DISCUSSION

In summary, the respondents represented 23 large organisations (with 250+ employees) that are in the process of upgrading or upgraded their ES systems. In total 41 respondents participated in both data collection techniques, out of which 29 experts returned completed web-based questionnaires and another 12 were involved in the semi-structured interviews. These experts have previously been involved in more than one upgrade and were actively involved with the decision-making process. The respondents represented diversified roles (Table 2) and the majority of them have more than 4 years' experience (Table 3) in managing ES. Hence, it can be argued that the respondents consulted in this study offer a distinct selection of expertise and knowledge, which supports in-depth views on the upgrade process, which was essential to provide the necessary depth and richness required to address the research question.

Role	Count
Solution Architect	7
Project Manager	10
Systems Analyst	4
Functional Lead	9
Technical Lead	7
Database Administrator	4
Systems Administrator	2
Chief financial controller	1
Database Administrator	1
Information systems manager	1

Table 1. Respondents' Roles

Experience	Count
Less than 1 year	0
1 to 2 years	1
2 to 4 years	5
4 to 6 years	4
6 to 8 years	14
More than 8 years	17

Table 2. Experts' Experience

Additionally, the study findings were presented and discussed with 10 respondents from 7 different organisations, with the aim of gathering their opinions as an alternative mechanism to evaluate the interpretation of the findings. These respondents were involved in more than two ES upgrade projects and were actively involved in the decision-making process. In addition, as a mechanism to gauge the relevancy of the drivers identified in respect of influencing the entire ES landscape upgrade decisions, the respondent were explicitly asked to suggest if such drivers were applicable to all the systems within the ES landscape.

4.1 The upgrade drivers

Drawing from the T-O-E framework, the upgrade drivers were classified into three contexts that is technology, organisational and environmental. Table 4 summarises the multiple factors influencing the decision to upgrade based on the three categories.

Context	Categories	Drivers
Environmental	Vendor Influence	Attain continuous vendor support
		Leverage latest technology
	Compliance	Comply with legislative guidelines
		Implement national standards
		Acceptable structure and mode of operating
	Trust in Consultants	Consultants' knowledge and experience
Organisational	Management Strategy	Merge systems across the organisation
		Management philosophy
		Continuous improvement
		Standardise functionality
		Business continuity
	Strategic direction	Automate existing business processes
		Restructure business processes
		Consolidate business processes
		Consistent system architecture
	Costs Consideration	Reduce maintenance Costs
		Licensing fees
		Infrastructure costs
		Testing and reapplication of modifications
Technological	Relative advantage	Integration of different systems
		Improved usability and security
		New functionality
	Compatibility issues	Stability
		Reliability

Table 3. Upgrade drivers' framework - a T-O-E perspective.

The technology context represents relevant existing and new technologies within or external to the organisation, though the focus is on the relative advantage and compatibility to existing systems. Organisational context describes internal measures such as costs, management support, and organisation strategic direction. Environmental context refers to the field in which an organisation operates; this includes elements such as government legislation, vendors, and consultants' support. However, according to Tornatzky & Fleischer (1990) specific drivers identified within these categorisations may vary across different studies, since the characteristics are subjective and dependent on the adopters' perception.

4.1.1 Environmental Context

This context represents those factors initiated by entities outside the organisation such as vendors, consultants, collaborators, and government agencies. Usually, environmental drivers are time sensitive, requiring organisations to undertake an upgrade within a specific timeframe. Though there are several environmental factors, the three main drivers that is vendor dependency, compliance and trust in consultant, were identified to have significant influences on the upgrade decision.

i. Vendor Dependency

Many organisations that opted not to upgrade their systems did not receive support in a timely fashion or had to pay high premiums to get support from the vendors. Therefore, it can be argued that vendors influence the decision to upgrade from two perspectives; first by withdrawing support for older versions, organisations are given no choice but to upgrade their systems in order to maintain continuous support.

Secondly, vendors promise functionality and technology enhancements including improvement to the underlying code and system architecture with every version release. Thus, in order to leverage these new technologies and features, organisations opt to upgrade to the latest version. Yet, these frequent improvements can be viewed as a strategic move by vendors to lock-in their customers (Kremers & van Dissel 2000). Nevertheless, it has resulted in some organisations opting to upgrade even when the new version does not offer any improvements or benefits, in order to ensure they are within the vendor's licensing and support agreement. This is mostly applicable to organisations that are depending on vendors for support, and have to upgrade to keep within the vendor release cycles in order to ensure continuous support.

ii. Trust in Consultants

It was recognised that most organisations call upon consultants' knowledge and expertise during upgrade discussions to gain relevant and timely information, relating to the new version in order to support and guide their decisions. The perception is that consultants can provide the detailed functionality descriptions in a manner that organisations can comprehend easily as compared to vendor documentation, press releases, and websites. In order to be effective, the data indicates that many organisations utilise the same set of consultants for many different projects including upgrades. As a result, trust and good working relationships are formed, which according to Ehie & Madsen (2005) is the key to reaching effective decisions in complex project situations. Thus, the collaboration facilitates avoiding potential pitfalls, risks and minimise business disruptions associated with upgrades. This paper suggests that consultants play a critical role in influencing upgrade decisions, however the level of influence depends on how much confidence the organisations places on the consultants' advice. As there are some organisations, which were encouraged to adopt outdated tools and such an ordeal resulted in the organisations losing trust in their consultant's abilities and experience. Hence, it is advised that when using consultants it is important to exercise caution; one possible way, is to determine where and when it is appropriate to use consultants during ES upgrade projects, in order not lose control of critical upgrade decisions.

iii. Compliance

Organisations upgrade their systems in order to comply with legislative mandates and constraints imposed on them, to ensure the systems are consistent and transparent. Additionally, organisations in regulated and centrally governed environments such as educational and banking institutes opt to upgrade in order to be operating within the acceptable standards and regulations. This explanation asserts that organisations in controlled environments upgrade their systems in order to keep up with the centrally governed policies. However, not many studies have considered compliance as a contributor to upgrade decisions; one possible explanation lies in the frequency (at minimum once a year) with which these legislation changes are applied to the systems. Thus, the implementations of these changes are considered to be routine tasks and can be accomplished by simply upgrading certain rules sets and attribute through a process known as patching. This explanation differs from the recommendation by Kremers & van Dissel (2000) who mention compliance as a technical upgrade. One explanation for this difference is that the level of planning when implementing legislative changes is minimal when compared to upgrading critical technical and functional aspects of the system. Even though compliance does not result in any changes to functional aspects or technical aspects of the system, yet it is an important attribute to consider during upgrade. As many organisations identified complying with legislative changes as a critical attribute that triggered the need to upgrade their systems.

4.1.2 Organisational Context

Organisational attributes are internal drivers that define the need to upgrade; these are initiated to support organisations to achieve certain strategic needs. Hence, advocating that organisation's characteristics can either facilitate or inhibit upgrade decisions, depending on stakeholder perspective. The following costs, management support, and strategic direction were identified to have significant influence on the upgrade decisions, these drivers are discussed next.

i. Costs Consideration

Cost is considered as an important attribute when making upgrade decisions, but it is a relative characteristic, which differs from one organisation to another. For example, high initial upgrade costs can lead to postponing the upgrade, however the consequences of such an action is an increase in operational costs, which is estimated to be around 20% to 30% of initial implementation costs. Cost is considered as a core factor when considering upgrades. On one hand, it was stipulated that upgrading facilitate reduction of overall operational, management and maintenance costs, resulting in the net effect of the proposed changes outweighing the investment costs. For example, in our study, some organisations claimed to achieve operating cost reductions by aligning the systems to a consistent architecture and replacing modifications with standard system functionality when upgrading. Though there was no evidence presented to substantiate if any costs reduction actually occurred after upgrading. On the other hand, there are several other cost considerations, which discourage upgrading these include licensing fees, infrastructure, testing, and reapplication of modifications. As, a result, some organisations opted not to take full advantage of the new version, because the return on investment could not be justified. Based on this explanation, it can be argued that costs can either influence or obstruct the decision to upgrade, depending on the different perspectives when considering upgrades. Thus, offering an alternative observation from previous studies, which advocate that costs act as an inhibitor to upgrade decisions.

ii. Management Support

When contemplating ES upgrades, management focuses on understanding limitations of the existing systems in respect of the organisation's strategic direction. From the findings, it can be argued that alt top management involvement is minimal but plays a significant role during ES upgrades. For example, when the upgrade projects received full support from management, there projects were assigned realistic timelines and resources. The cases where management support was not attained, resulted in a high level of trade-offs, and short duration assigned to the project. Hence, it becomes difficult to achieve the objectives, which affects the upgrade justification and possibly leads to postponing the upgrade, or only undertaking a small portion of the upgrade. The management support level during upgrade aligns to the idea of persuasive upgrade, which implies an upgrade would be undertaken when influenced by either an internal or an external force. Hence, revealing that most organisations would not upgrade immediately when a new version is released, as they do not want to be the 'leading edge' technology adopters.

iii. Strategic Direction

Most organisations review their business processes and add new functionality as part of their upgrade plans. Consequently, filtering repetitive processes and improving existing or adding new processes to improve efficiency and provide a platform to evaluate existing business operations. Hence, upgrading facilitates business continuity and competiveness, yet this is only viable when upgrades occur in a timely manner. Kremers & van Dissel (2000) postulate that undertaking upgrades in a timely manner provides higher gains and differentiates the organisation from competitors. Though, there was no indication of any competitive advantage gained after upgrading, a possible explanation is that most of the projects were defined within a smaller scope, therefore it was difficult to measure gain in competitiveness. However, according to Loh & Koh (2004) having a smaller scope allows to define clear and achievable objectives, which supports the organisation's requirements, and as a result decrease the chances of failure. The organisation's strategic direction with its justification plays a critical role in upgrade decisions, specifically when the upgrade would not fulfil the requirements, this can result in the organisation postponing the upgrade.

4.1.3 Technological Context

There are several advantages gained by upgrading, such as new features and improved productivity, but it also introduces challenges due to different functionality or technological platform imposed on the system. The changes may provide better agility and flexibility but may not be compatible with the existing version, hence making the system landscape unstable and increasing the chances of disruption occurring. The next section addresses compatibility and business needs, which were identified to have significant influence on defining the need to upgrade.

i. Compatibility

The different changes imposed on the system require rigorous testing to guarantee that the systems are operating with minimum interruption and its performance is not affected, in return assuring the systems are stable and reliable. There is a significant difference between an existing version and new version especially in system objects that could lead to disruptions particularly when not compatible with existing modifications. These results in the majority of the workload to be associated with testing and resolving compatibility issues. Not surprisingly, all organisations in this study considered testing as one of the main activities during upgrades, and several different testing strategies are utilised to ensure systems operate as planned. This involves identifying and proposing mechanisms to address all the changes in code and systems objects, which introduces compatibility issues. Depending on the level of the modifications and effort required to address these issues, the organisation will assess if it is feasible to move ahead with the upgrade.

ii. Relative Advantage

The frequent change in business structures and processes, dictates the need for newer functionality and better technology that can enable expansion and integration with other systems. These expansions lead to many other challenges, for example the need for new functionality and a common platform among the different systems. Hence, some organisations elected to upgrade their systems as a mechanism to gain additional capabilities and features introduced by the new version. In addition, upgrading provides a platform to support the business users' requirements of additional features and functionality that help streamline certain processes. Our findings highlighted that upgrading allowed reviewing of existing processes, which resulted in process standardisation and automation. In addition, it was identified that as organisations acquired other entities or merged with other entities, this introduced a new challenge of ensuring that the different systems from all the organisations are working in cohesion with each other. This dictated the need for redefining the processes along with consolidation and integration of the systems into a uniform system architecture, which allows for more transparency and greater accountability. Thus, organisations opt to upgrade to take advantage of the improved technologies to support integration and consolidation of these systems.

5 IMPLICATIONS AND CONCLUSIONS

This study finding indicates that upgrading is a complex phenomenon and suggests that the decision to upgrade is dependent on balancing the interaction of numerous technological, organisational, and environmental drivers, irrespective of the systems or vendors providing these systems. Furthermore, it suggests that the stakeholders involved in the decision process have different agendas in regards to the upgrade outcome. For example, from the technical perspective an upgrade implies changing the underlying system, while business users think of upgrades as a mechanism for incorporating new functionality and improving existing processes. On the other hand, management perceive upgrades as an opportunity to apply strategic plans and improve overall business performance and direction. Thus, there is a need to balance the needs of these different stakeholders, in order to reach a consensus that benefits the organisation. As part of the study findings, it is proposed that the interaction of the different upgrade drivers results in either a direct or an indirect influence on the upgrade decision, specifically on selecting the type of upgrade to implement. Direct influence means that one attribute openly sways the selection of a specific upgrade type, for example, dependency on vendor results in a technical upgrade. Indirect influence occurs when one upgrade driver category results in performing either a technical, functional upgrade or both upgrades. For example, if the upgrade goal is to ensure take advantage of latest functionality to support the business users' requirements, then only functional upgrade may be commissioned. However, if the underlying system's technical platform cannot support these changes, it creates a necessity for undertaking both technical upgrade and functional upgrade, in order to ensure the system can support the proposed functionality changes.

The findings presented bear similarity to prior studies explained in section 2.1, and arguably, there may be specific characteristic for each individual system. However, as this study considers ES to be a holistic system that incorporates several systems, it suggests that the above drivers play critical role in influencing ES upgrades as whole, though the identified drivers do not comprehensively address each individual system within the ES landscape. Additionally, by using T-O-E framework as a comprehensive analytical lens for categorising these drivers, it is stipulated that the need to upgrade is dependent on numerous technological, organisational, and environmental drivers and the interactions between these contexts, irrespective of the systems or vendors providing these systems. The findings presented in this paper extends previous studies by suggesting an alternative perspective to understanding the different factors that motivate organisations to upgrade their ES, specifically since it considers upgrade of various systems. Though the aim of the study was not to determine which factors had more influence over the others, keeping up to date with the vendor's release cycles plays a significant role in influencing upgrade decisions. This suggests that vendors have a stronghold in upgrade decisions specifically on organisations that rely on vendors for continuous support and maintenance. While from the organisational and technological contexts the need for new functionally is highlighted as the most significant driver for upgrades. Prior studies demonstrated that upgrade costs have a negative influence, however this study positions upgrade costs to have both positive and negative outcome, depending on how the stakeholders value the proposed upgrade benefits. Thus, it can be explained that organisations would only opt to upgrade when there are tangible and intangible benefits aligned with the upgrade process, however these benefits are perceived differently from one organisation to another.

Despite the small group of respondents involved in this research, the two data collection approaches allowed discovery of several upgrade drivers contributing to the growing body of literature on ES upgrade. However, as the majority of the respondents represent large organisations, the findings could be considered context sensitive. Therefore, further efforts to expand and extend the findings are required; this could include comparing upgrade experiences by cross-examining large, medium, and small-scale organisations to offer a broader understanding of drivers influencing upgrade decisions. In addition future research, could adapt the proposed categorisation to specific systems within the ES landscape to establish similar or conflicting arguments, in order to confirm or improve the findings presented in this paper and offer generalisation of these findings to wide-ranging upgrade phenomenon. On the hand, future research could apply change management concepts to explore the full upgrade cycle to provide a detailed understanding of the dynamic nature of ES upgrade, in order to identify strategies and mechanisms that can help to establish a balance between the needs of the stakeholders.

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